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Broadband echosounders offer the potential for improved target classification of zooplankton using measurements of backscattering strength across a wide frequency range (frequency response). Previous work has shown that supervised machine learning is a powerful tool for classifying unknown, single-species aggregations in acoustic data using frequency response. However, this volume backscatter-based approach is less effective for mixed-species aggregations. Here, a method for classification of individual zooplankton using target strength frequency response, TS(f), is proposed. Supervised classification algorithms were trained using *ex-situ* TS(f) measurements for future application to *in-situ* survey data. TS(f) measurements (283-383 kHz) were made of the copepods *Paraeuchaeta norvegica* and krill (a mixture of Northern krill, *Meganyctiphanes norvegica*, and *Thysanoessa* spp.) in a tank. Using these data, 12 supervised classification algorithms were compared. This method was then applied to a more realistic scenario using tank TS(f) measurements of *P. norvegica* and a community sample with *P. norvegica* removed ('non-target zooplankton'). The best-performing classification algorithm, XGBoost, classified *P. norvegica* or krill with 95.95% (± 0.47) accuracy, and *P. norvegica* or non-target zooplankton with 97.30% (± 0.41) accuracy. Results suggest that, where single target detection is possible, this is a highly accurate and robust method for target classification of zooplankton.

Comparing acoustic data acquired with research vessel l'Europe and USV DriX:

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Developments of Unmanned Surface Vehicules substantially progressed over the past few years, enabling to provide extensive monitoring capacities for physical and biological processes and achieve sustainable management of the maritime domain. In order to investigate their performance and the way they could be used to complete traditional vessel survey acquisitions, a five-days technical survey with a 7 meters-long DriX USV has been carried out along Mediterranean coast. USV was equiped with ES70 and ES200 EK80, along with IcListen hydrophone and EM2040 multibeam. Simultaneous acquisitions were performed with l'Europe reasearch vessel fitted with similar echosounders. First analysis of comparative data will be presented, in terms of data quality (detection range and surface bubbling) as well as biomass observation and single target detection.

Estimation and correction of depth range and echo level errors due to water-column temperature and salinity on sound scattering layer.

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Water temperature and salinity are the key environmental parameters involved in the acoustic signal processing. In absence of clear procedure, temperature and salinity value are usually used at a fixed point in the water column to estimate the sound celerity in the studied area. Considering temperature and salinity as having negligible effects in estimates of acoustic variables may

lead to errors in dependent acoustic variables as the volume backscattering coefficient Sv, the nautical area backscattering coefficient sA and the target distance, i.e., depth for vertical echosounder. We examine the impact of environmental errors and their effects on the level of Sv, sA and range r. The results shown that the effect may not be negligible. The nautical area backscattering coefficient sA was the most affected by environmental errors. The deep ocean areas were the most concerned by these errors vs. surface and shallow coastal areas. Failure to correct for environmental errors in acoustic studies can lead to inaccurate results on the positions of the targets studied and biomass assessment. Abacuses were built to identify areas of interest where environmental corrections should be implemented and we share corrective code integrating temperature and salinity water profile for fisheries acoustics data correction.

Developing and deploying machine learning methods for acoustic data

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Machine learning methods are well suited for classification tasks and has been extensively used for acoustic data in the recent years. This presentation gives an overview of the effort on acoustic target classification using machine learning methods in Norway. The work includes new machine learning methods adapted to acoustic data, both fully supervised methods as well as semi supervised methods. We also investigate how to combine auxiliary information with classical convolutional methods. To efficiently use these new methods on acoustic data, the data needs to be prepared for efficient access and we have developed a cloud solution for efficient data access. Automated deployment of the methods on platforms like unmanned surface vehicles, research vessels and ships of opportunity is made possible through a combination of docker containers and Kongsberg Maritime's Blue Insight platform. This allows adaptive survey strategies, which is a step towards fully autonomous acoustic surveys. Finally, we present both the short term and the long term plan for how this will be used on IMRs surveys.

Investigating EK80 data quality on different platforms

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Each time a new acoustic equipment is integrated on a new or existing platform, much care is taken to optimize its location and electronic integration. The performance of a system and the data quality remains however platform dependent and reduced performances sometimes require posterior investigation. Case of degradation of surface data of ES18 transducers on research vessels and example of broadband electric noise investigation on different platforms will be presented in order to exchange about possible issues and best practices.

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